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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE:	HIGH BEAM LIGHT FOR HEADLAMPS OF MOTOR VEHICLES
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FIELD OF THE INVENTION

[0001] The invention relates to a headlamp having a reflector or projector design, wherein the headlamp includes at least one low beam light chamber and at least one high beam light chamber.

BACKGROUND

[0002] In the case of a headlamp having a discharge light source for low beam light, the change from low beam light operational mode to high beam light operational mode is solved by means of an additional statical light chamber having halogen light source, or by means of the mechanical movement of the optical element, such as discharge light source, an occulter, a reflector or a part of the reflector, relative to the whole headlamp (see the patent documents US 5 769 525, DE 197 41 377, DE 197 10 632).

[0003] The disadvantages of the above mentioned solutions include the use of additional action members, their installation in headlamp, the increased weight of the whole headlamp, the greater susceptibility of the system to failure, and the higher cost of said headlamp.

[0004] A further concern occurs when using the discharge light source in the flasher mode, where the service life is decreased as a consequence of repeated switching on.

[0005] At the present time this function is solved by means of an additional light chamber, which is also used for high beam light. From this point of view the most advantageous solution for optimization of high beam light operational mode seems to be use of an adjusting action member, which must be part of an automatic

adjusting system in a construction having a discharge light source, and use of a horizontal action member to allow horizontal swiveling of low beam light chamber.

[0006] This automatic adjusting system comprises sensors for evaluation of the angle of inclination of the vehicle, a control unit for evaluation of input signals from sensors, and an adjusting action member to respond to the control unit.

[0007] The adjusting action member provides swiveling of the whole reflector around a pivot fulcrum so as to maintain correct adjustment of the vertical inclination of the low beam boundary, according to the prescribed requirements.

[0008] The horizontal adjusting action member allows for a change in the horizontal position of the low beam light chamber for better illumination of the road in curves.

SUMMARY OF THE INVENTION

[0009] The above mentioned disadvantages have been reduced or eliminated by means of a headlamp for motor vehicles for low beam and high beam light operational modes with at least one low beam light chamber having a discharge light source and at least one high beam light chamber working as an addition to the low beam light. In the high beam light operation mode, both the low beam light chamber and high beam light chamber are vertically adjusted by means of vertical adjusting action member and the low beam light chamber is further horizontally adjusted by means of a horizontal adjusting action member.

[0010] For high beam light operation mode, both the low beam light chamber and high beam light chamber can be advantageously vertically adjusted by means of the vertical adjusting action member.

[0011] For high beam light operation mode, the low beam light chamber can be advantageously horizontally adjusted by means of the horizontal adjusting action member.

[0012] In a preferred embodiment according to the present invention, the vertical adjusting action member forms part of automatic adjusting system.

[0013] In a further preferred embodiment according to the present invention, the horizontal adjusting action member forms part of the mechanism allowing the horizontal swiveling of the low beam light chamber.

[0014] Switching on the halogen light source is advantageously delayed relative to switching on of the high beam light.

[0015] The halogen light source is advantageously used for high beam lights.

[0016] For low beam light, the rays are produced only by the low beam light chambers. For high beam light, the rays are produced both by the high beam light chambers and low beam light chambers, wherein the direction of the rays produced by the light chambers is optimized through the horizontal and vertical swiveling of the headlamp light chambers.

[0017] Accordingly, the disadvantage of additional external action members is eliminated by means of a headlamp comprising low beam and high beam light chambers having approximately parabolic or elliptic shape, occulter, lens in case of using elliptically shaped reflector, discharge light source, halogen light source, vertical adjusting action member, automatic adjusting system allowing a change in the vertical adjustment of the reflector for a correct headlamp adjustment according to the requirements prescribed for low beam light, a mechanism allowing a change

in the horizontal position of low beam light chamber, and a horizontal adjusting action member.

[0018] Inside both of the light chambers, in proximity of their optical axes, there are arranged a discharge light source and a halogen light source, which are firmly attached in relation to the light chambers. The discharge light source is used for both low beam and high beam lights. The halogen light source is used for high beam lights and flasher mode operation.

[0019] Both light chambers are together vertically adjustable by means of the vertical adjusting action member. The low beam light chamber can be further horizontally rotated (swiveled), in relation to the high beam light chamber, by means of the horizontal adjusting action member.

[0020] The optical axis of high beam light chamber, with the halogen light source, is inclined at a predetermined fixed angle to the horizontal plane.

[0021] In the low beam operation mode using the low beam light chamber with its discharge light source, the light beam rays produced thereby run divergently below a distinct light-darkness border, whereby this border is inclined below the horizontal plane at a certain angle. The inclination of this boundary with respect to the horizontal plane is kept constant by means of an automatic adjusting system (automatic leveling).

[0022] The hot spot for low beam light is situated so as to be below a high-darkness border on the right side of light track from low beam light unit in case of right-hand traffic, and oppositely for left-hand traffic.

[0023] For optimization of the high beam light, it is necessary to adjust the low beam light chambers so as to locate the hot spots from the low beam light rays in proximity of the hot spots from the high beam light rays.

[0024] In the high beam operation mode, the low beam light chamber with the discharge light source and high beam light chamber with the halogen light source are simultaneously used. The light beam coming out of the high beam light chamber, with the halogen light source, is roughly collimated.

[0025] In the above mentioned manner one can achieve better illumination of the road, decreased forefield on the road and better illumination of adjacent road shoulders via means of low beam light dispersion. The adjustment of light chambers is carried out by means of the same action members that are used for headlamp adjustment for the low beam light mode, as well as for the horizontal movement of the low beam light chamber. Automatic adjusting system can work both in the low beam light and high beam light operational modes.

[0026] The headlamp itself does not comprise any additional parts over and above the parts usually found with current types of discharge headlamps.

[0027] Only software and hardware modification of the automatic adjusting system is needed, and thus, an algorithm for swiveling of low beam light chambers is changed.

[0028] "Switching-on" the halogen light source can occur with simultaneous "switching-on" of the high beam light mode and subsequent adjustment of light chambers or in the course of adjusting the light chambers or at the end of adjustment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The preferred, but not limiting, embodiment of the present invention is described below with reference to the accompanying drawings, in which:

[0030] Figure 1 is a view of the prior art adjustment of light traces from current headlamps wherein a trace from a low beam light chamber is shown on the left and a trace from a high beam light chamber is shown on the right.

[0031] Figure 2 is a view of a newly proposed adjustment of light traces of the headlamp with optimization of high beam light.

[0032] Figure 3 is a view of composite light traces during the high beam light operational mode without high beam light optimization.

[0033] Figure 4 is a view of composite light traces during the high beam light operational mode with high beam light optimization.

[0034] Figure 5 is a view of composite light traces during the high beam light operational mode with both vertical and horizontal optimization of high beam light.

[0035] Figures 6 and 7 are front and rear views, respectively, of a mechanical embodiment of the headlamp.

DETAILED DESCRIPTION

[0036] Referring to Figures 6 and 7, the headlamp comprises a low beam light chamber 1, a high beam light chamber 3, a discharge light source 2 for the low beam light chamber 1, a halogen light source 4 for the high beam light chamber 3, an adjusting action member 5 for adjusting to a correct vertical headlight adjustment, a horizontal adjusting action member 6, an optical axis 7 of low beam light chamber 1 and an optical axis 8 of high beam light chamber 3.

[0037] Inside both light chambers 1 and 3, in proximity of their optical axes 7 and 8, there are arranged the discharge light source 2 and the halogen light source 4, which are firmly attached in relation to the light chambers 1 and 3 by conventional methods. The discharge light source 2 is used for both low beam and high beam operational modes. The halogen light source 4 is used for the high beam operational mode and a flasher mode.

[0038] Both light chambers 1 and 3 are together vertically adjustable by means of the vertical adjusting action member 5. The low beam light chamber 1 can be further horizontally rotated (swiveled), in relation to the high beam light chamber 3, by means of horizontal adjusting action member 6.

[0039] The optical axis 8 of high beam light chamber 3 with halogen light source 4 is inclined at a predetermined fixed angle β to the horizontal plane, as is noted in Figure 2, with its hot spot located below the horizontal plane.

[0040] In the low beam operation mode using the low beam light chamber 1 with discharge light source 2, the produced rays of the light beam run divergently below a distinct light-darkness border, whereby this border is inclined below the horizontal plane at a certain angle α . The inclination of this boundary to the horizontal plane is kept constant by means of an automatic adjustment system (automatic leveling).

[0041] In the high beam operation mode, the low beam light chamber 1 with discharge light source 2 and high beam light chamber 3 with halogen light source are simultaneously used. The light beam coming out of the high beam light chamber 3 with halogen light source 4 is roughly collimated.

[0042] For optimization of the high beam light operational mode, it is necessary to adjust the low beam light chambers 1 so as to have hot spot produced by low beam light rays in proximity of hot spot produced by the high beam light rays.

[0043] In the above mentioned manner one achieves better illumination of the road, decreased forefield on the road and better illumination of lay-by shoulders by means of low beam light dispersion. The adjustment of light chambers 1 and 3 is carried out by means of the same action members 5 and 6, which are used for adjusting of a correct headlamp adjustment for the low beam light mode as well as for the horizontal movement of the low beam light chamber 1. Automatic adjusting system can work both in the low beam light and high beam light modes.